APPENDIX B: POPULATION PROJECTION METHODOLOGY

The cohort component model is one of the oldest and most widely used procedures for projecting population. It was developed by Edwin Cannon in 1895 as a simple method of accounting for population growth. It is based upon a balancing equation where population growth is a function of added births, deducted deaths, added in-migrants, and deducted out-migrants. The modern version was developed by P.K. Whelpton in 1936 and has the added benefit of accounting for population change by age groups that are called cohorts. The computer software spreadsheet model used in Fort Worth's projection was developed by Ned Levine and documented in a book by Richard E. Klosterman, Richard K. Brail and Earl Bossard entitled Spreadsheet Models for Urban and Regional Analysis in 1993 by the Center for Urban Policy Research at Rutgers University in New Brunswick, New Jersey.

Two general equations are used. The first calculates the future population of children ages zero to nine and the second calculates the future population of persons age ten and over. The first equation takes the form $P_{10} = P_0 + (B - D) + (IM - OM)$ where P_{10} is the population ten years into the future, P_0 is the initial population, B is births, D is deaths, IM is in-migration and OM is out-migration. For the youngest age groups – 0 to 9, P_0 is always equal to zero and births during the ten-year period are added. The second equation takes the form $P_{10} = P_0 - D + (IM - OM)$. Births are not a factor for age groups that are 10 or older.

Births (B) are calculated using a fertility estimation technique called the child-woman ratio. It is a simple ratio of the number of children ages zero to nine to women in their reproductive years 10 to 49. Deaths (D) are calculated by applying to each cohort a survival ratio; this is the probability that a member of one age group will survive to become a member of the next age group. Survival rates for the United States are published annually by the U.S. Bureau of Vital Statistics. Age specific survival rates for local areas are not available, however, data from the Fort Worth Health Department indicate that the annual death rate, the number of deaths per 1,000 citizens, is five percent greater in Fort Worth (5.3) than for the U.S. as a whole (5.0). Thus, the only adjustment necessary was to reduce the U.S. survival rates slightly for Fort Worth to calibrate the model. Net migration is inferred from the model by applying the balancing equation in reverse.

The model assumes that the child-woman ratios, survival rates, and migration will continue unaltered from the base year into the future. It is virtually impossible to account for unforeseen changes in the economy, changes in family values, medical advancements or fertility enhancements that might influence population growth. It is also impossible to account for large fluctuations from the growth trends in any given year. For these reasons, projections must be used with caution and should be reevaluated frequently, as new data becomes available.